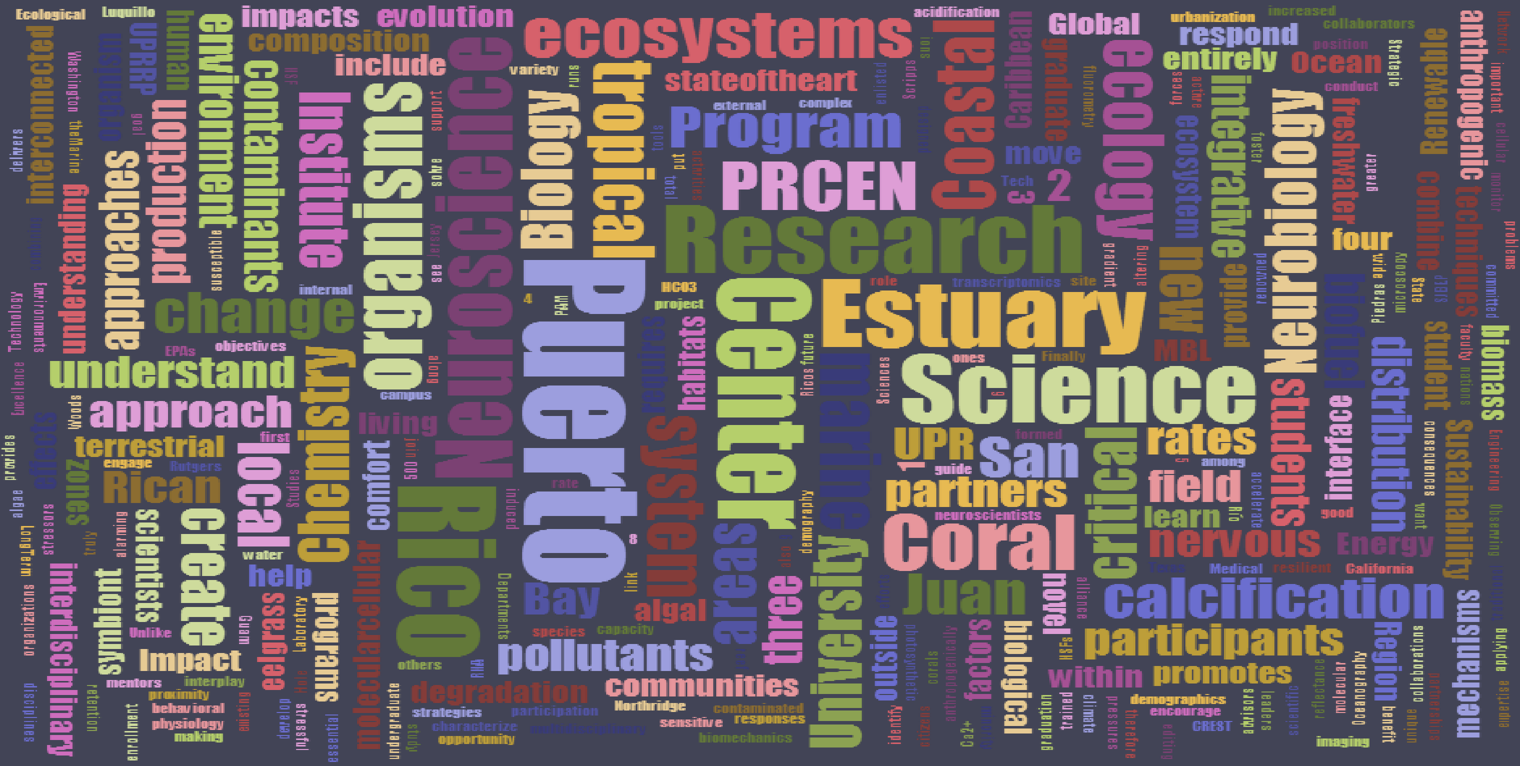


CONTAMINANTS OF EMERGING CONCERN IN THE SAN JUAN BAY ESTUARY AND ASSOCIATED ORGANISMS

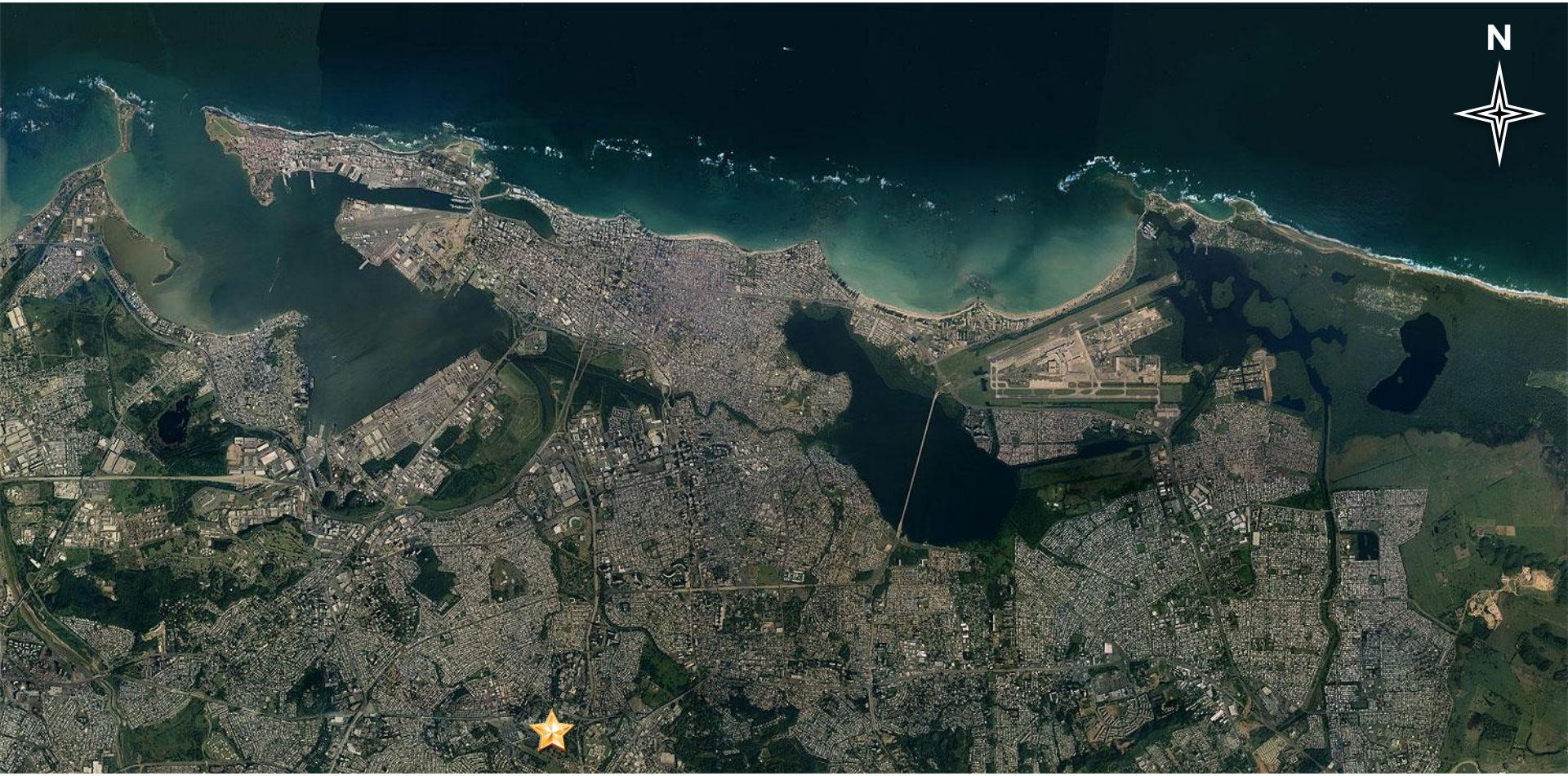
2014 EPA Region 2 Caribbean Science Consortium/Non-PRASA Systems Workshop

Dr. Loretta Roberson, Dept of Environmental Science, UPRRP

Contaminants of emerging concern

- Affect humans and/or non-target organisms
- Possible subtle effects following exposure to low concentrations
- Complex mixtures could result in additive, synergistic, or antagonistic effects
- Continuous discharge could result in "pseudo-persistence" in the environment
- May accumulate in aquatic organisms

The San Juan Bay Estuary



Model Systems

Overview of Projects

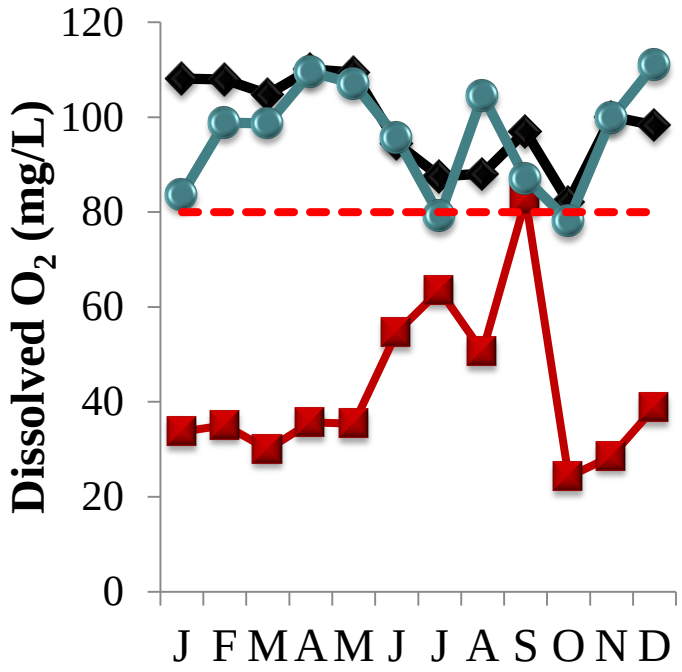
- Presence and distribution of contaminants of emerging concern in the San Juan Bay Estuary, Puerto Rico
- Detection and bioremediation of contaminants of emerging concern
- Impact of pollutants, acidification, and hypoxia on the distribution and abundance of fish and blue crabs in a tropical estuary system

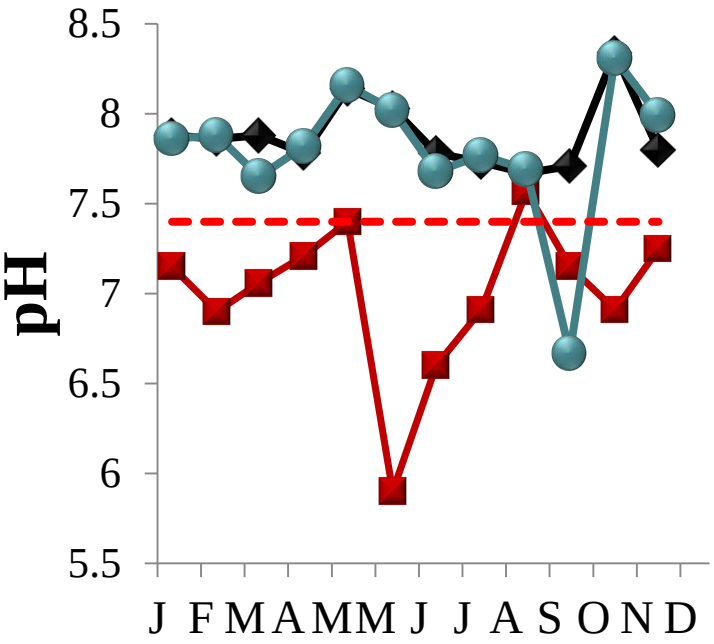
Presence and distribution of contaminants of emerging concern in the San Juan Bay Estuary

- In collaboration with San Juan Bay Estuary Program and CariCOOS
- 12 sites throughout San Juan Bay Estuary
- Annual monitoring program
- Focus on several compounds of interest as well as general screening
- Will include metals and nutrients
- Developing physical, biological and contaminant models to better understand exposure risks and impact on organisms and ecosystems

Water Quality in the San Juan Bay Estuary

2013 Data from the San Juan bay Estuary Program





San Juan Bay 1

Peninsula La Esperanza

Condado Lagoon

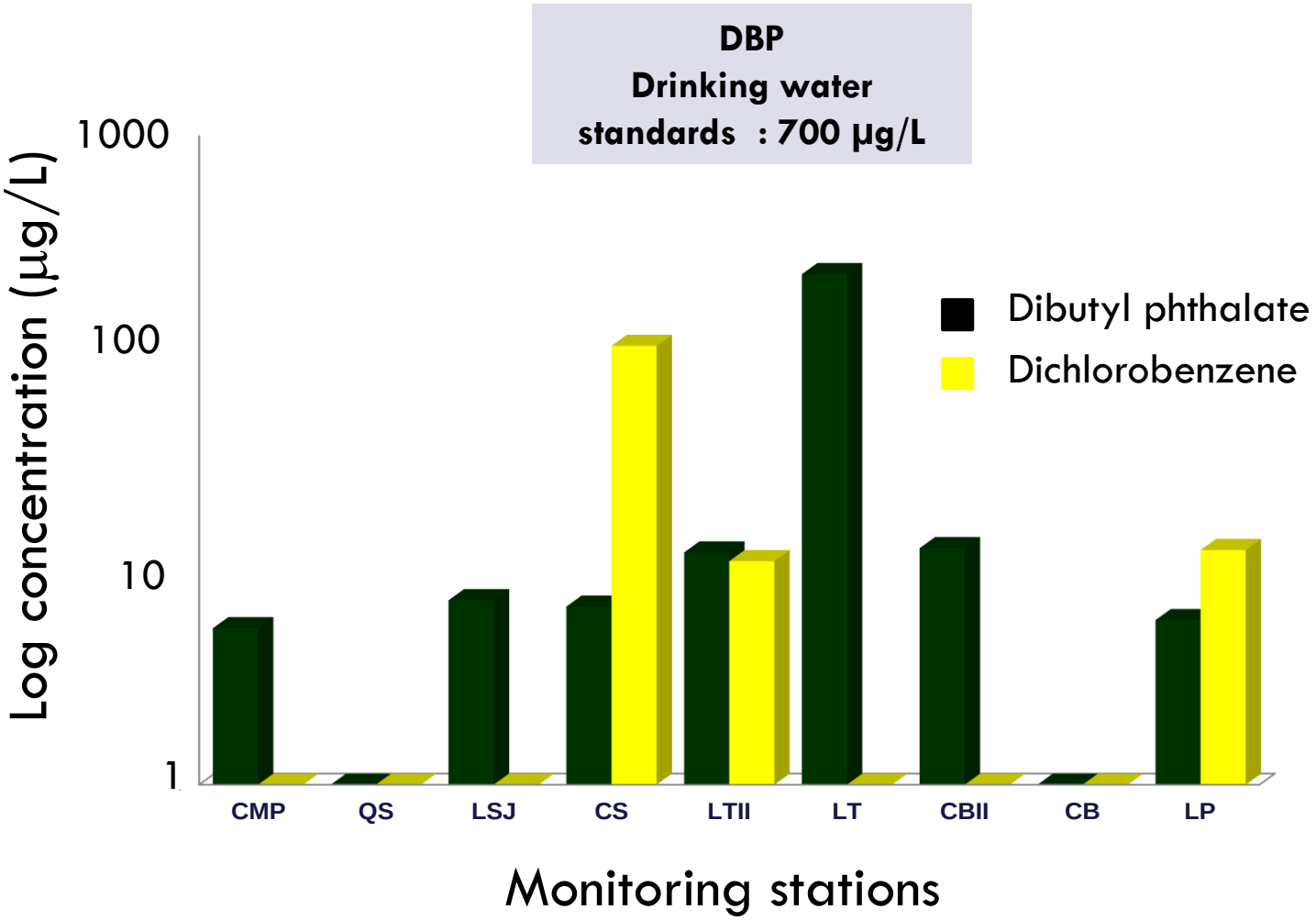
Types of compounds identified in water and tissues

Category	Water	Algae	Oyster	Crab	Fish
Plasticizer	18	1	2	17	9
Pharmaceutical	8	2	1	8	3
Personal Care	10	9	9	20	1
Pesticides	3	1	1	15	2
Hydrocarbons	6	5	4	2	1
Multi use	43	7	8	21	8
TOTAL	**88**	**25**	**25**	**83**	**24**
	SJBE	LT	LT	CS	LC

Most prevalent contaminants 2012 – 2013

Contaminant name	Station
1,2-Benzenedicarboxylic acid, dibutyl ester (DBP)	CB,CS, LP, LSJ1, LT3, LT4, QSA
1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester	CS, LP, LSJ1, LT3
2-Ethylhexyl phthalate	CB, CS, LP, LT4
Hexadecane	CS, LP, LT4
1,2-Benzenedicarboxylic acid, diethyl ester	CS, LP,
1-Phenylethanone	LP, LSJ1
Dichlorobenzene (DBC)	CS, LP

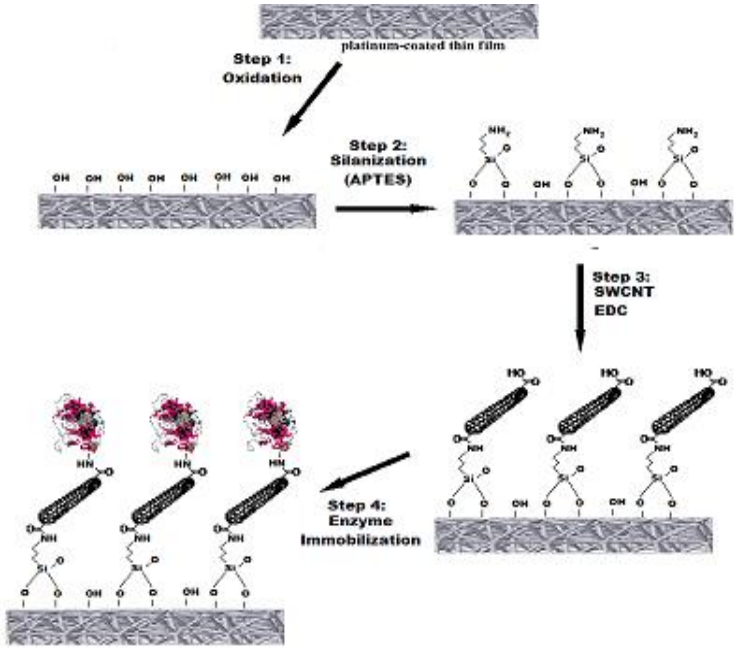
DBP and DCB distribution in the San Juan Bay Estuary 2013



Detection and bioremediation of contaminants of emerging concern

- A collaboration between Environmental Science and Chemistry at UPRRP (Dr. Liz Diaz)

- Future goal is to develop sensitive, portable detection systems for organic contaminants as well as removal systems



Biosensor - multi- hydrogel entrapped enzyme nanotube composite array

Detection and bioremediation of contaminants of emerging concern

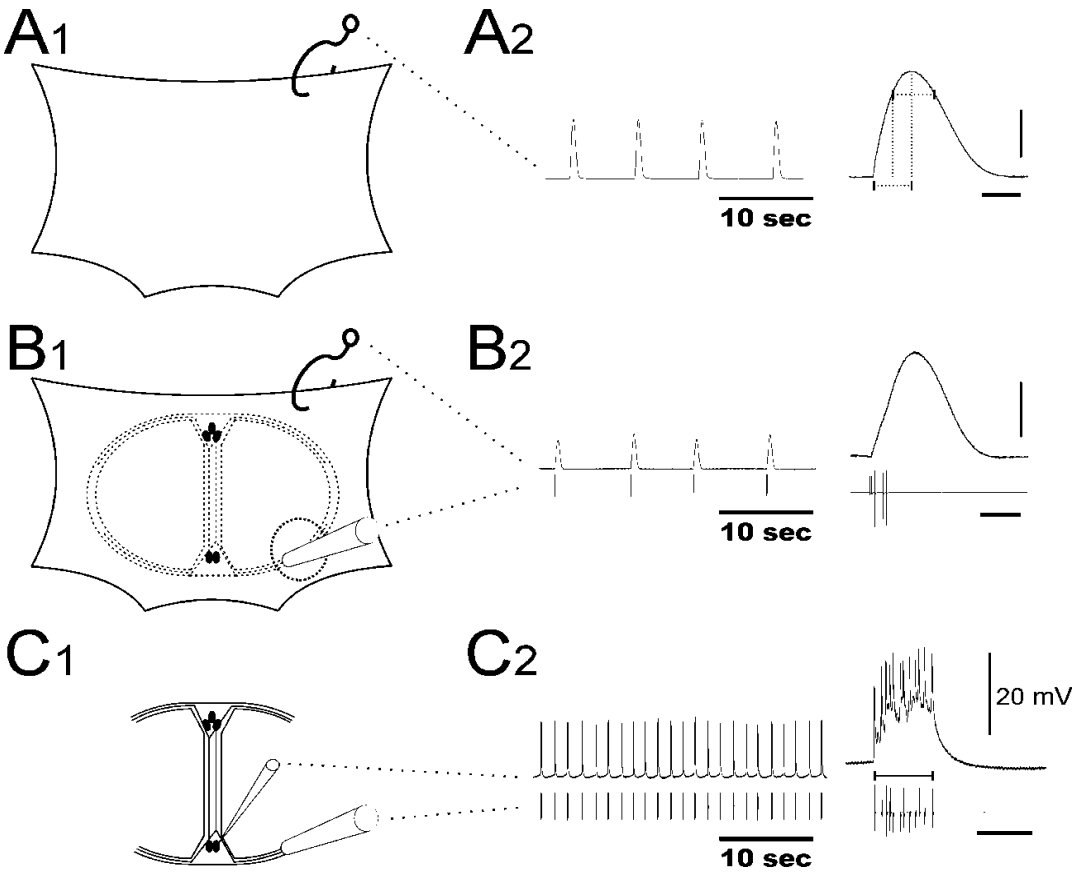
Environmental Neuroscience

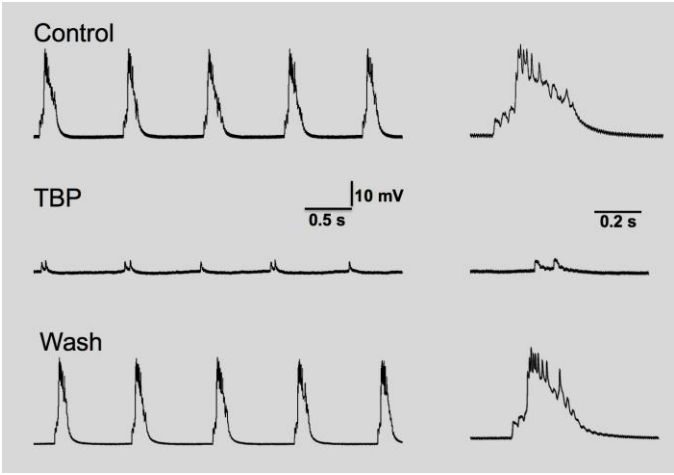
- The nervous system is the interface between an organism and its environment
- Nervous system communication can be disrupted by environmental contaminants
- Environmental neuroscience can provide sensitive tools to better understand the potential impacts of acute and chronic exposure to contaminants

PRCEN

Puerto Rico Center for Environmental Neuroscience

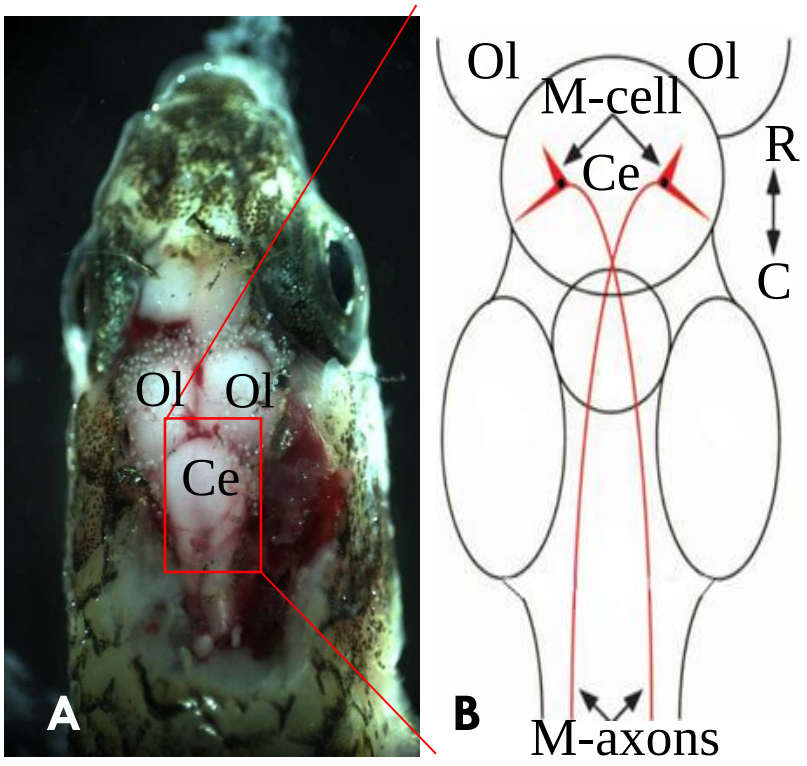
The Central Pattern Generator-Effector System in the Crab Heart





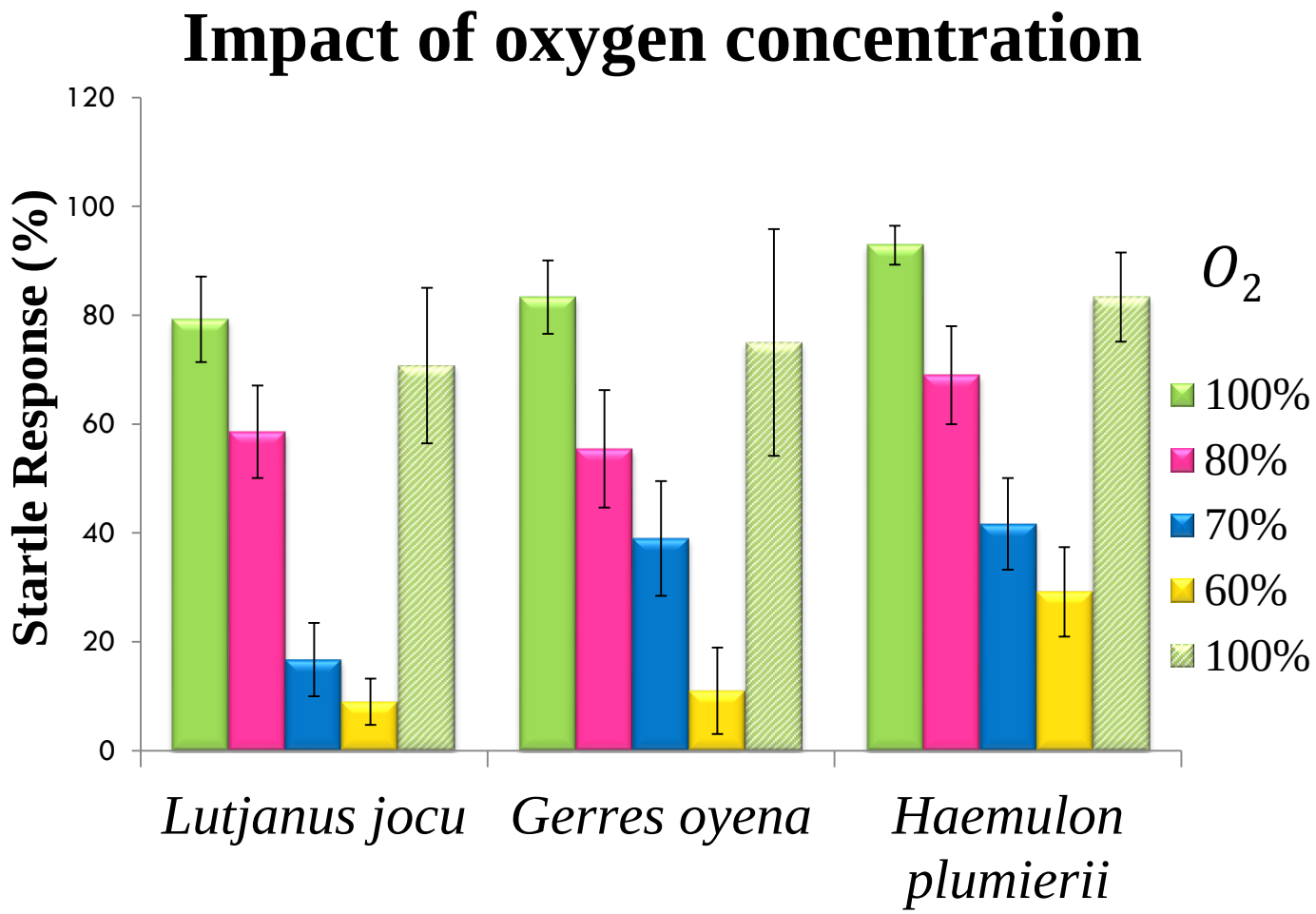
Fort T J et al. J Neurophysiol 2004;92:3455-3470

Mauthner cells in fish

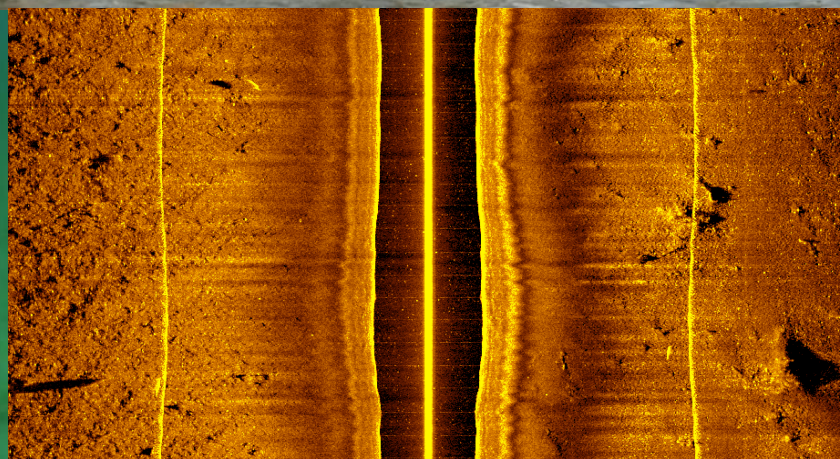


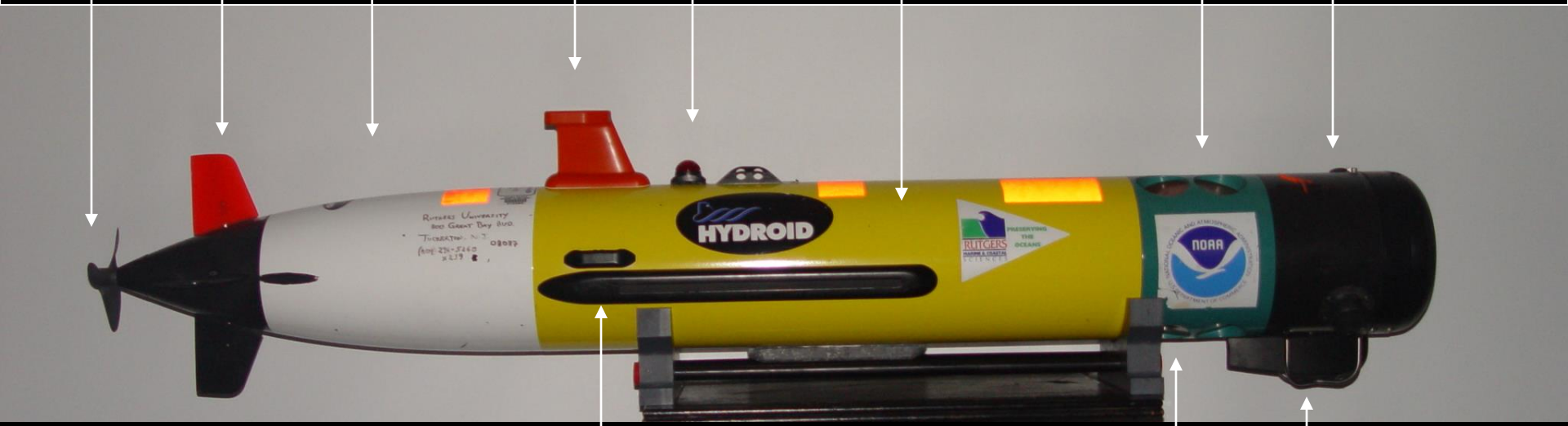
http://sunburst.usd.edu

Startle response in fishes



Impact of pollutants on distribution and abundance of fish and crabs





Speed: 0.5 to 5 knots

Duration: 14+ hrs

Depth: 100 m

Power: 1kW (4 L.ion smart Batteries)

Sidescan Transducer

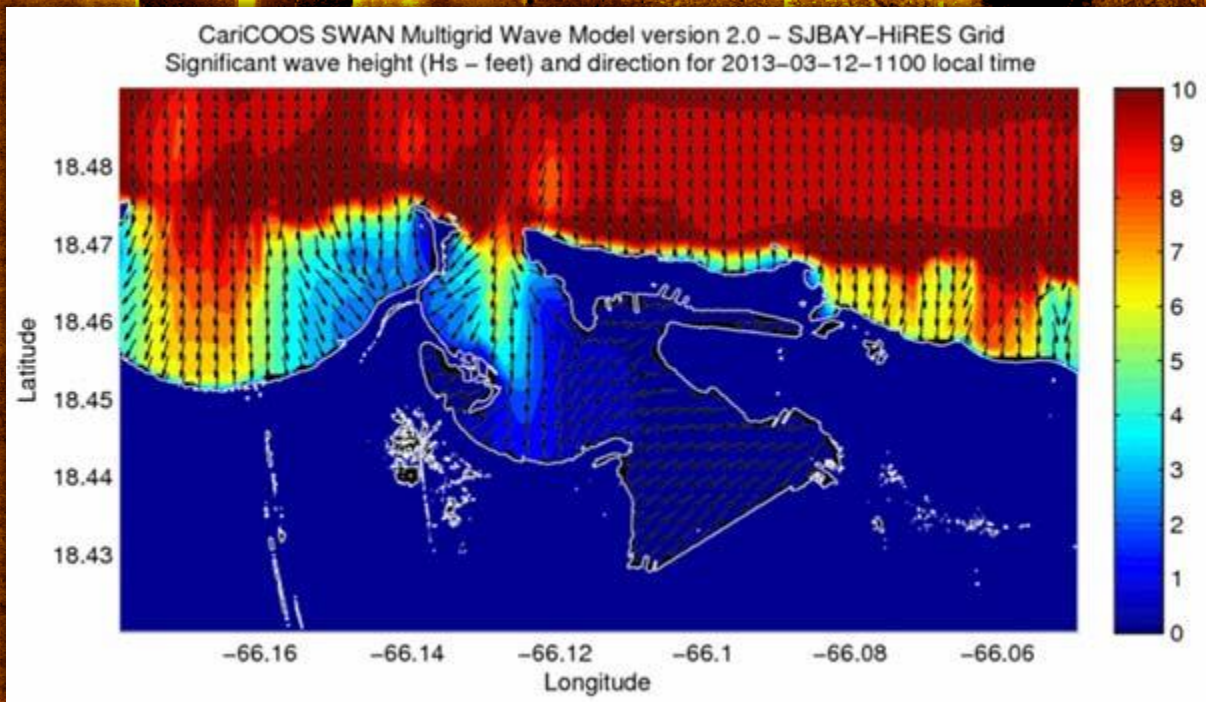
ADCP DO_2

CDOM, Chlorophyll A

1.6 meters

43 kg

Sturgeon Tracking – Hudson River

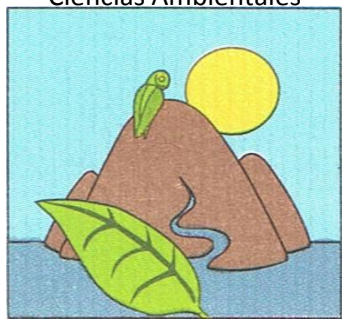


Support and Collaborators

PRCEN
Puerto Rico Center for Environmental Neuroscience

NSF

Departamento de Ciencias Ambientales
Universidad de Puerto Rico
Recinto de Río Piedras



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PROGRAMA DEL Estuario de la Bahía de San Juan

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